

## **REMARKS/ARGUMENTS**

### **I. Concerning the Amendments**

The independent claims are amended to specify that the glycol ether comprises a propylene glycol or butylene glycol-based compound of the given formula. In addition, the subject matter of Claim 6 is incorporated into Claim 1 and, as applicable, into Claim 13. Claim 6 is cancelled as it no longer limits its base claim.

The amendments are presented in an attempt to advance prosecution. Entry of the amendments presented herein is solicited under 37 CFR 1.116(a) in view of the fact that the amendments cancel claims or put them in better form for consideration on appeal.

### **II. Concerning the Rejection under 35 U.S.C. 103**

Claims 1, 4, 6-10, 12 and 13 stand rejected under 35 USC 103 as being obvious over Baniel et al. (hereinafter Baniel) in view of "evidentiary references."

Applicants understand the rejection to be that the invention is obvious over Baniel in view of Kimble and Lehnhardt. In addition, Allen, which is not prior art, is cited by Examiner to show the LCST of a binary mixture of water and diethylene glycol n-hexyl ether.

Baniel discloses an extraction process for recovering phosphoric acid from aqueous solutions "using certain organic solvents selected from the group of esters, ketones and glycol ethers ... ." Baniel states that these solvents must have from 2 to 15 carbon atoms. Baniel does not specifically disclose any solvent within the formulas of Applicants' claims, as amended.

Kimble discloses a process for the solvent extraction of a mercaptoalkanoic acid from an aqueous medium using certain solvents. The solvents disclosed by Kimble differ from Applicants' solvents in that, for example, Applicants' solvents contain a hydroxyl group, whereas Kimble does not disclose the use of mono-ethers of propylene or butylene glycols. None of Kimble's solvents fall within the formulas of Applicants' claims.

Lehnhardt discloses that organic acids can be recovered from fermentation broth by producing a clarified feed, acidifying the feed by the addition of a mineral acid to lower the pH of the feed to from about 1.0 to about 4.5 to produce an acidified feed that is substantially saturated with respect to at least one electrolyte of a specified class, and extracting the acidified feed with an extraction mixture which includes (a) water, (b) a mineral acid in a significant quantity, and (c), an oxygenated solvent of 4 to 12 carbon atoms that carries at least one functional group selected from the group consisting of hydroxyl, ester, keto, ether, carbonyl, and amido. Lehnhardt's broad teaching does not specifically identify any solvent within the formulas of Applicants' claims.

Allen is a publication co-authored by Applicants Frank and Donate, and is not prior art. Examiner recognizes that Allen is not prior art, but relies on Allen to establish the fact that the lower critical solution temperature (LCST) of a binary mixture of water and diethylene glycol n-hexyl ether is 12 °Celsius. Applicants note, however, that the LCST of Applicants' claims is the LCST of the initial mixture of water, solvent and solute, not the binary mixture of Allen. Allen does not change the fact that the prior art had no appreciation of the importance of LCST regarding the ability of a solvent to extract a hydrophilic organic compound from an aqueous solution.

Examiner's rationale is that while Baniel discloses that inorganic phosphoric acid can be extracted from an aqueous solution using a broad class of solvents, it does not disclose the extraction of organic compounds with a solvent of Applicants' claims such that the partition ratio, K, is greater than 1 and does not disclose that the initial mixing of solvent and aqueous liquor is conducted at a temperature that is not more than 20 °C above the LCST. Examiner would solve Baniel's deficiencies in part by citing Kimble and Lehnhardt to show that it was known at the time the invention was made to extract certain organic compounds from aqueous liquors using broad classes of oxygenated solvents.

The invention is the first process to use solvents with high mutual solubility in water to economically separate hydrophilic compounds from water, and to economically recover those solvents, which generally can not be economically separated from water by distillation.

Neither Baniel, Kimble nor Lehnhardt recognize such a process. In addition, the prior art lacks many elements of Applicants' claims, such as Applicants' claim elements specifying that the partition ratio,  $K$ , be at least 1, the claim element relating to LCST, the claim element regarding solvent recovery, and the claim element relating to inverse solubility of the solvent in water. The solvents of Applicants' claims are not suggested by or specifically identified in Baniel, Kimble or Lehnhardt. Those references teach a vast universe of possible solvents, but do not name any that are within the formulas of Applicants' amended claims. Accordingly, Applicants submit that the references neither teach nor suggest a process as claimed by Applicants, as many elements of the claims are not mentioned in the references.

Baniel discloses a process for extracting phosphoric acid, optionally by adding a small amount of water or purified phosphoric acid. Baniel is also described in Applicants' specification at page 1. As recognized by Examiner, phosphoric acid is not an organic compound. Furthermore, Baniel does not disclose any of the solvent compounds of Applicants' claims, as amended. Applicants' Claim 1 requires that the solvent have an inverse solubility in water. In contrast, some of the solvents, such as acetone, that are within the vast generic solvent class of Baniel are completely water-soluble. When Baniel states that the solvent must be able to dissolve the solute better at low temperature than at a high temperature, it is indeed the solute that is referred to and not water. Baniel is also silent regarding the claim elements concerning LCST, solvent recovery, and the partition ratio  $K$ . In summary, Baniel discloses a process for extracting inorganic materials using different solvents and is silent regarding the use of solvents having inverse solubility in water and is also silent concerning other elements of Applicants' claims.

Kimble is directed to a process for recovering mercaptoalkanoic acids from aqueous media by employing at least one of an alkanolic acid ester and an alkylene glycol ether. Kimble does not disclose the use of mono-ethers of propylene or butylene glycols. None of Kimble's solvents fall within the formulas of Applicants' claims. The solvents of Kimble formula III are terminated with  $R_4$ , which can be an alkanoyl group of 2-12 carbon atoms or which can be  $R_3$ , which is an alkyl group of two to six carbon atoms. In contrast, Applicants' claims, as amended, use solvents that are terminated with a hydrogen atom ( $R''' = \text{hydrogen}$ ). In addition, Kimble does

not employ heating, and does not perform a forward and back extraction. Kimble also displays no appreciation of the claim elements concerning LCST, the partition ratio K, or solvent recovery.

In making an obviousness rejection, it is important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [prior art] elements in the way the new invention does, and such analysis should be made explicit. KSR Int'l Co. v. Teleflex, Inc., 127 S.Ct. 1727, 1741 (2007). The prior art does not mention several of the elements, e.g. the solvents, LCST limits, solvent recovery step, or partition ratio, of Applicants' claims. It is unclear why the prior art, which makes no mention of these elements, would motivate one skilled in the art to use them in the processes claimed by Applicants.

Applicants respectfully submit that Baniel, either alone or in combination with Kimble and Lehnhardt, neither teaches nor suggests the process of Applicants' claims.

B. Claims 2 and 11 stand rejected under 35 USC 103(a) as being obvious over Baniel in view of Shinnar et al.

Claims 5 and 15 stand rejected under 35 USC 103(a) as being obvious over Baniel in view of Ludmer et al.

For the purposes of this response, Applicants elect to have the patentability of Claims 2, 5, 11 and 15 stand or fall with the patentability of the independent claims.

### III. Conclusion

For the foregoing reasons, reconsideration of the claims and passing of the application to allowance are solicited.

Respectfully submitted,  
/Paul D Hayhurst/  
Paul D. Hayhurst  
Registration No. 30,180  
Phone: 989-636-373

P. O. Box 1967  
Midland, MI 48641-1967  
PDH/sk